

REMARKS

Favorable reconsideration of this application, in light of the following discussion, is respectfully requested.

Claims 1-45 are currently pending. Claims 1-4, 6, 9, 11-13, 15, 16, and 26 have been amended; and Claims 27-45 have been added by the present amendment. The changes and additions to the claims are supported by the originally filed specification and do not add new matter.

In the outstanding Office Action, Claims 1, 3-10, and 12-26 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,444,478 to Lelong et al. (hereinafter “the ‘478 patent”); Claim 1 was rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,507,665 to Cahill et al. (hereinafter “the ‘665 patent”); Claims 2 and 11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the ‘478 patent in view of U.S. Patent No. 6,507,366 to Lee (hereinafter “the ‘366 patent”); and Claim 26 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the ‘478 patent in view of U.S. Patent No. 6,304,313 to Honma (hereinafter “the ‘313 patent”).

Amended Claim 1 is directed to an image processing method for correcting image distortions, comprising: (1) inputting a plurality of partially overlapping images of a tangible object on an object plane, the plurality of partially overlapping images sharing a common location of the tangible object and being created by capturing a tangible object on the tangible object plane from different directions to the tangible object plane; (2) determining a feature point of one of the plurality of partially overlapping images corresponding to the common location of the tangible object, and determining a matched point at one of the other partially overlapping images corresponding to the feature point so that a direction of the tangible object plane is calculated based on the feature point and the matched point, the tangible object plane being defined by a spatial orientation of the tangible object; (3) selecting one of

the plurality of partially overlapping images as a standard image whose image distortions are to be corrected; and (4) generating a distortion-corrected image on a projection plane by projecting the standard image onto the projection plane based on the direction of the tangible object plane such that image distortions of the standard image are eliminated. The changes to Claim 1 are supported by the originally filed specification and do not add new matter.¹

The '478 patent is directed to a method of processing images for constructing a target image from adjacent source images I1, ... In. As shown in Figure 1G, the '478 patent discloses that, for example, three cameras having a common viewpoint P have three corresponding image planes I1, I2, and I3, and corresponding optical axes PZ1, PZ2, and PZ3. As illustrated in Figures 5A, 5B, and 7C, the '478 patent discloses a system in which a target image I0 is constructed based on the source images I1 to In by selecting a point m' on the target image plane I0, projecting through the point m' from viewpoint P, and determining a corresponding point on one of the image planes I1-In along the projection direction. Further, the '487 patent discloses that the pixel value at the intersection point on one of the image planes is used for a pixel value at m' on the target image plane I0. Further, as shown in Figure 7D, the '478 patent discloses that the image thus created for the virtual image plane I0 can be processed to remove distortion and perspective faults.

However, Applicants respectfully submit that the '478 patent fails to disclose the step of inputting a plurality of partially overlapping images of a tangible object on an object plane, the plurality of partially overlapping images sharing a common location of the tangible object and being created by capturing the tangible object on the tangible object plane from different directions to the tangible object plane, as recited in amended Claim 1. Applicants respectfully submit that the '478 patent fails to disclose the tangible object plane recited in Claim 1. Rather, the '478 patent discloses multiple *image* planes corresponding to cameras C1-Cn, and

¹ See, e.g., Figs. 2 and 5 and the discussion related thereto in the specification.

a virtual *image* plane I0, which is unrelated to the claimed tangible object plane. Further, Applicants respectfully submit that the '478 patent fails to disclose determining a matched point of the partially overlapping images corresponding to a feature point so that a direction of the tangible object plane is calculated based on the feature point and the matched point, the tangible object plane being defined by a spatial orientation of the tangible object. Applicants respectfully submit that the '478 patent fails to disclose a tangible object plane being defined by a spatial orientation of a tangible object. Further, Applicants respectfully submit that the '478 patent fails to disclose that the matched point is determined so that a direction of the tangible object plane is calculated based on the feature point and the matched point. The '478 patent does not disclose calculating a direction of the tangible object plane based on the feature point and the matched point. The process of generating the image shown in Figure 7C of the '478 patent is based on selecting pixel values from either image I_i or I_j, or by interpolating pixel values obtained from the two images.

Further, Applicants respectfully submit that the '478 patent fails to disclose generating a distortion-corrected image on a projection plane by projecting the standard image onto the projection plane based on the direction of the tangible object plane such that image distortions in the standard image are eliminated, as recited in Claim 1. In this regard, Applicants note that the direction of the tangible object plane recited in this step was previously calculated based on the feature point and the matched point, as recited in Claim 1. In this regard, Applicants note that page 8 of the outstanding Office Action refers to element 112 in Figure 3 and the recitation in column 8, line 11 as reading on the step of generating the distortion-corrected image. However, element 112 is an interpolator used to find the pixel value in generating Figure 7C, as shown in Figure 4. Moreover, the passage cited in column 8 refers to projecting two images into a same plane, but does not disclose that a selected standard image is projected onto a projection plane in order to eliminate image distortions,

based on a direction of a tangible object plane, as recited in Claim 1. As discussed above, the '478 patent does not disclose the tangible object plane. Rather, the disclosure in column 8 refers to the image planes of two different cameras.

In the Response to Arguments section of the outstanding Office Action, the Office Action refers to the point M in Figure 5A as reading on the claimed tangible object plane. However, Applicants respectfully submit that label M shown in Figure 5a refers to a *point*, not a plane. Further, Applicants note that, on page 5 of the outstanding Office Action, the Office Action refers to a virtual plane C0. However, Applicants respectfully submit that the '478 patent discloses that C0 is a virtual *camera*, not a virtual plane. Further, Applicants note that, in point 7 on page 5 of the outstanding Office Action, the Office Action appears to admit that the '478 patent fails to disclose the tangible object plane recited in Claim 1. In this regard, Applicants note that the Office Action states that "...arguments...have been fully considered and are persuasive...." Further, the Office Action states that Lelong et al....is silent with calculating a plane at the cite of the tangible plane...but Lelong et al. is not too clear as to whether a plurality of points form a plane where its normal can be computed from the plane or points at the cite and of the tangible plane."

For the reasons stated above, Applicants respectfully submit that the rejection of Claim 1 as anticipated by the '487 patent is rendered moot by the present amendment to Claim 1.

Independent Claims 6, 7, 9, 15, and 16 recite limitations analogous to the limitations recited in Claim 1. Moreover, Claims 6, 7, 9, 15, and 16 have been amended in a manner analogous to the amendments to Claim 1. Accordingly, for reasons analogous to the reasons stated above for the patentability of Claim 1, Applicants respectfully submit that the rejections of Claims 6, 7, 9, 15, and 16 (and all similarly rejected dependent claims) are rendered moot by the present amendment to the independent claims.

The '665 patent is directed to a method of generating a panoramic environment map from a plurality of stereo image pairs of a scene including the step of generating orthographic range values from each of the stereo image pairs corresponding to the orthogonal distance of image features in the stereo pairs from an image capture point. Further, the '665 system includes the step of warping the transformed range values onto a cylindrical surface and forming therefrom a plurality of warped range images, and blending the overlapped regions of the registered warp range images to generate a panoramic environment map containing range information. However, Applicants respectfully submit that the '665 patent fails to disclose the step of inputting a plurality of partially overlapping images of a tangible object on an object plane, the plurality of partially overlapped images sharing a common location of the tangible object and being created by capturing the tangible object on the tangible object plane from different directions to the tangible object planes, as recited in Claim 1. Further, Applicants respectfully submit that the '665 patent fails to disclose determining a matched point of one of the other partially overlapped images corresponding to a feature point so that a direction of the tangible object plane is calculated based on a feature point and the matched point, the tangible object plane being defined by a spatial orientation of the tangible object, as recited in Claim 1. Rather, the '665 patent discloses warping transformed range values onto a cylindrical surface to thereby form a plurality of warped range images. Accordingly, Applicants respectfully submit that the rejection of Claim 1 as anticipated by the '665 patent is rendered moot by the present amendment to that claim.

Regarding the rejection of dependent Claims 2, 11, and 26 under 35 U.S.C. § 103, Applicants respectfully submit that the '366 and '313 patents fail to remedy the deficiencies of the '478 patent, as discussed above. Accordingly, Applicants respectfully submit that the rejections of dependent Claims 2, 11, and 26 are rendered moot by the present amendment to Claims 1 and 9.

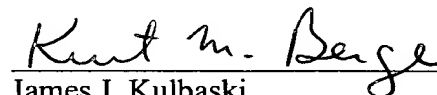
The present amendment sets forth new Claims 27-45 for examination on the merits. New Claims 27-30 depend from Claim 1. New Claims 31-45 depend from Claims 6, 7, 9, 15, and 16, and recite limitations corresponding to the limitations recited in Claims 28-30. New Claims 27-45 are supported by the originally filed specification and do not add any new matter.²

Thus, it is respectfully submitted that independent Claims 1, 6, 7, 9, 15, and 16 (and all associated dependent claims) patentably define over any proper combination of the '478, '665, '366, and '313 patents.

Consequently, in view of the present amendment and in light of the above discussion, the outstanding grounds for rejection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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² See, e.g., Figures 8-12 and the discussion related thereto in the specification.